SUBSECTION 8.5

Noise

8.5 Noise

The project site is located in the City of San Joaquin, in the County of Fresno. Generally, the design basis for noise control is the minimum, or most stringent, noise level required by any of the applicable laws, ordinances, regulations or standards (LORS). Because the site is located within the city limits, noise regulations for the City of San Joaquin would be controlling. However, we have also analyzed noise impacts with respect to a CEQA significance standard that CEC has typically applied to other projects.

Section 8.5.1 presents the fundamentals of acoustics while a description of the LORS is presented in Section 8.5.2. The affected environment is described in Section 8.5.3 and the Environmental Consequences (i.e., the project impacts from both construction and operation) are analyzed in Section 8.5.4. Mitigation measures proposed to reduce potential impacts below the level of significance are presented in Section 8.5.5. The involved agencies and agency contacts are listed in Section 8.5.6. The permits and permitting schedule are discussed in Section 8.5.7. Section 8.5.8 provides the noise references.

8.5.1 Fundamentals of Acoustics

Acoustics is the study of sound and noise is defined as unwanted sound. Airborne sound is a rapid fluctuation or oscillation of air pressure above and below atmospheric pressure creating a sound wave. Acoustical terms used in this subsection are summarized in Table 8.5-1.

TABLE 8.5-1
Definitions of Acoustical Terms

Term	Definition
Ambient Noise Level	The composite of noise from all sources near and far. The normal or existing level of environmental noise or sound at a given location.
Intrusive	Noise that intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends upon its amplitude, duration, frequency, time of occurrence, tonal content, the prevailing ambient noise level as well as the sensitivity of the receiver.
Decibel (dB)	A unit describing the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure sound pressure, which is 20 micropascals (20 micronewtons per square meter).
A-Weighted Sound Level (dBA)	The sound level in decibels as measured on a sound level meter using the A-weighted filter network. The A-weighted filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise. All sound levels in this report are A-weighted.
Equivalent Noise Level (L_{eq})	The average A-weighted noise level, on an equal energy basis, during the measurement period.
Percentile Noise Level (L_n)	The noise level exceeded during n percent of the measurement period, where n is a number between 0 and 100 (e.g., L_{90})
Day-Night Noise Level (L_{dn} or DNL)	The average A-weighted noise level during a 24-hour day, obtained after addition of 10 decibels from 10:00 p.m. to 7:00 a.m.

The most common metric is the overall A-weighted sound level measurement that has been adopted by regulatory bodies worldwide. The A-weighting network measures sound in a similar fashion to how a person perceives or hears sound, thus achieving very good correlation in terms of how to evaluate acceptable and unacceptable sound levels.

A-weighted sound levels are typically measured or presented as equivalent sound pressure level (L_{eq}), which is defined as the average noise level, on an equal energy basis for a stated period of time, and is commonly used to measure steady state sound or noise that is usually dominant. Statistical methods are used to capture the dynamics of a changing acoustical environment. Statistical measurements are typically denoted by L_{xx} where xx represents the percentile of time the sound level is exceeded. The L_{90} is a measurement that represents the noise level that is exceeded during 90 percent of the measurement period. Similarly, the L_{10} represents the noise level exceeded for 10 percent of the measurement period.

Another metric used in determining the impact of environmental noise is the differences in response that people have to daytime and nighttime noise levels. During the nighttime, exterior background noises are generally lower than the daytime levels. However, most household noise also decreases at night and exterior noise becomes more noticeable. Furthermore, most people sleep at night and are sensitive to noise intrusion. To account for human sensitivity to nighttime noise levels, the Day-Night Sound Level (L_{dn} or DNL) was developed. DNL is a noise index that accounts for the greater annoyance of noise during the nighttime hours.

DNL values are calculated by averaging hourly L_{eq} sound levels for a 24-hour period, and apply a weighting factor to nighttime L_{eq} values. The weighting factor, which reflects the increased sensitivity to noise during nighttime hours, is added to each hourly L_{eq} sound level before the 24-hour DNL is calculated. For the purposes of assessing noise, the 24-hour day is divided into two time periods, with the following weightings:

- Daytime: 7 a.m. to 10 p.m. (15 hours) Weighting factor of 0 dB
- Nighttime: 10 p.m. to 7 a.m. (9 hours) Weighting factor of 10 dB

The two time periods are then averaged to compute the overall DNL value. For a continuous noise source, the DNL value is easily computed by adding 6.4 dB to the overall 24-hour noise level (L_{eq}). For example, if the expected continuous noise level from the power plant was 60.0 dBA, the resulting DNL from the plant would be 66.4 dBA.

The effects of noise on people can be listed in three general categories:

- Subjective effects of annoyance, nuisance, dissatisfaction
- Interference with activities such as speech, sleep, learning
- Physiological effects such as startling and hearing loss

In most cases, environmental noise produces effects in the first two categories only. However, workers in industrial plants typically experience noise effects in the last category. No completely satisfactory way exists to measure the subjective effects of noise, or to measure the corresponding reactions of annoyance and dissatisfaction. This lack of a common standard is primarily due to the wide variation in individual thresholds of annoyance and habituation to noise. Thus, an important way of determining a person's subjective reaction to a new noise is by comparing it to the existing or "ambient" environment to which that person has adapted. In general, the more the level or the tonal (frequency) variations of a noise exceed the previously existing ambient noise level or tonal quality, the less acceptable the new noise will be, as judged by the exposed individual.

Table 8.5-2 shows the relative A-weighted noise levels of common sounds measured in the environment and in industry for various sound levels.

TABLE 8.5-2
Typical Sound Levels Measured in the Environment and Industry

Noise Source at a Given Distance	A-Weighted Sound Level in Decibels	Noise Environments	Subjective Impression
	140		
Civil Defense Siren (100 ft)	130		
Jet Takeoff (200 ft)	120		Pain Threshold
	110	Rock Music Concert	
Pile Driver (50 ft)	100		Very Loud
Ambulance Siren (100 ft)			
	90	Boiler Room	
Freight Cars (50 ft)		Printing Press Plant	
Pneumatic Drill (50 ft)	80	In Kitchen With Garbage Disposal Running	
Freeway (100 ft)			
	70		Moderately Loud
Vacuum Cleaner (10 ft)	60	Data Processing Center	
Department Store			
Light Traffic (100 ft)	50	Private Business Office	
Large Transformer (200 ft)			
Personal Computer (3 feet)	45	Quiet Office	Quiet
	40		
Soft Whisper (5 ft)	30	Quiet Bedroom	
	20	Recording Studio	
	10		Hearing Threshold

Source: Peterson and Gross, 1974.

8.5.2 Laws, Ordinances, Regulations, and Standards

The following are the applicable laws, ordinances, regulations and standards that apply to noise generated by CVEC. They are summarized in Table 8.5-3.

8.5.2.1 Federal

8.5.2.1.1 USEPA

The federal government has no standards or regulations applicable to offsite noise levels from the project. However, guidelines are available from the USEPA (1974) to assist state and local government entities in development of state and local LORS for noise. The recommended level for protection against activity interference and annoyance at rural residences is a DNL level of 55 dBA. This is equivalent to a continuous noise level of 49 dBA.

TABLE 8.5-3
Applicable Laws, Ordinances, Regulations, and Standards

LORS	Purpose	Applicability (AFC Section Explaining Conformance)
Federal Offsite: USEPA	Guidelines for state and local governments.	Not Applicable
Federal Onsite: OSHA	Exposure of workers over 8-hour shift limited to 90 dBA.	Sections 8.5.2.1.2, 8.5.4.2.1 and 8.5.4.3.1. Also see Section 8.7, Worker Safety, of AFC.
State Onsite: Cal/OSHA 8 CCR Article 105 Sections 095 et seq.	Exposure of workers over 8-hour shift limited to 90 dBA.	Sections 8.5.2.2.1, 8.5.4.2.1 and 8.5.4.3.1. Also see Section 8.7, Worker Safety, of AFC.
State Offsite: Calif. Vehicle Code Sections 23130 and 23130.5	Regulates vehicle noise limits on California highways.	Delivery trucks and other vehicles will meet Code requirements.
Local California Government Code Section 65302	Requires local government to prepare plans that contain noise provisions.	City of San Joaquin conforms, Section 8.5.2.3
City of San Joaquin Noise Ordinance	Establishes a 50-dBA standard for residential uses.	Sections 8.5.2.3 and 8.5.4.3.3
City of San Joaquin General Plan	Establishes a 50-dBA standard for residential uses.	Sections 8.5.2.3 and 8.5.4.3.3

8.5.2.1.2 OSHA

Onsite noise levels are regulated, in a sense, through the Occupational Safety and Health Act of 1970 (OSHA). The noise exposure level of workers is regulated at 90 dBA, over an 8-hour work shift to protect hearing (29 Code of Federal Regulations [CFR] 1910.95). Onsite noise levels will generally be in the 70- to 85-dBA range. Areas above 85 dBA will be posted as high noise level areas and hearing protection will be required. The power plant will implement a hearing conservation program for applicable employees and maintain exposure levels below 90 dBA.

8.5.2.2 State of California

8.5.2.2.1 Cal-OSHA

The California Department of Industrial Relations, Division of Occupational Safety and Health enforces California Occupational Safety and Health Administration (Cal-OSHA) regulations, which are the same as the federal OSHA regulations described previously. The regulations are contained in 8 California Code of Regulations (CCR), General Industrial Safety Orders, Article 105, Control of Noise Exposure, Sections 5095, et seq.

8.5.2.2.2 California Vehicle Code

Noise limits for highway vehicles are regulated under the California Vehicle Code, Sections 23130 and 23130.5. The limits are enforceable on the highways by the California Highway Patrol and the County Sheriff’s Office.

8.5.2.3 Local

The California State Planning Law (California Government Code Section 65302) requires that all cities, counties and entities (such as multi-city port authorities) prepare and adopt a General Plan to guide community change. Both the city and county General Plans contain noise provisions.

Table 8.5-4 summarizes the applicable City noise regulations, since the project site is located in the City of San Joaquin. The County of Fresno's noise regulations do not apply and have not been included. The most restrictive standard applicable to CVEC is the 50 dBA residential standard set forth in the City's noise ordinance and the General Plan.

TABLE 8.5-4
Summary of Applicable Local Noise Regulations for the City of San Joaquin

Applicable Regulation	General Standard		
Noise Ordinance—Chapter 8.24	Exterior noise level of 50 dBA for residential districts between the hours of 10 p.m. to 7 a.m., 60 dBA between the hours of 7 a.m. and 7 p.m. and 55 dBA between the hours of 7 p.m. to 10 p.m.		
	Exterior noise level of 60 dBA for commercial districts between the hours of 10 p.m. to 7 a.m. and 65 dBA at all other times.		
	Exterior noise level of 70 dBA for industrial districts at all times.		
Comprehensive General Plan—1996	Sets forth the following land use-based "Recommended Ambient Allowable Noise Level Objectives"		
	Land Use	**7 a.m. to 10 p.m. (dBA)**	**10 p.m. to 7 a.m. (dBA)**
	Hospitals/Rest Homes	45	40
	Passive Recreation Areas	45	45
	Schools/Churches	45	45
	Agriculture	50	50
	Low Density Housing	50	50
	Multi-Family Residential	55	50
	Neighborhood Commercial	55	55
	Professional Office	55	55
	Retail Commercial	60	55
	Outdoor Active Recreation	70	70
	Light Manufacturing	70	65
	Heavy Manufacturing	75	70

Source: City of San Joaquin (1996 and 2001).

8.5.3 Affected Environment

The site is located on an 85-acre parcel in the southeastern portion of the City near the north intersection of Springfield Avenue and Placer Avenue. The site is bounded to the north and east by Colorado Avenue and a railroad corridor. Existing uses on the site include irrigated agriculture, power lines and an irrigation canal. A small portion on the northern side of the site is used for heavy commercial/light industrial uses (City of San Joaquin, 2001a). The general plan land use designation for the site is Heavy Manufacturing (HM). The site is zoned Manufacturing (M).

Noise-sensitive land uses closest to the site are primarily isolated residential buildings located in farmlands surrounding the site. The closest sensitive receptor is located approximately 1,500 feet east of the project's property line at the northeast corner of Yuba Avenue and Springfield Avenue.

Sources of environmental noise near the site primarily include vehicular traffic on Colorado Avenue and the neighboring streets and rail traffic on the adjacent Union Pacific Railroad (UPRR) tracks.

8.5.3.1 Ambient Noise Survey Methodology

Measurements were made at five locations and are listed in Table 8.5-5, which represent the residential areas of most concern. The locations are shown in Figure 8.5-1 (all figures are at the end of the section).

TABLE 8.5-5
Noise Monitoring Locations

Map ID	Description
G1	On the south side of Dinuba Avenue between Colusa and Placer avenues
G2	On the east side of Colusa Avenue south of Manning Avenue
G3	South side of Springfield Avenue east of Sutter Avenue
G4	Northeast corner of Yuba and Springfield avenues
G5	Northwest corner of Yuba and Manning avenues

Source: Hessler Associates, 2001.

Rion NL-06, ANSI Type 2, statistical monitors were used to continuously record sound levels over a 35-hour period encompassing two nights at G1 and G2 beginning at 6:00 p.m. on Tuesday, December 26, and ending at 7:00 a.m. on Thursday, December 28, 2000. The monitors were set up to measure the average sound level, L_{eq}, and statistical parameters over consecutive 15-minute periods. All measurements were overall A-weighted levels, dB. This data set was supplemented by intermittent spot checks made with a Rion NA-29E 1/1-octave band analyzer (recording the same parameters). The primary reason for the spot checks was to observe and note existing noise sources along with weather conditions. Weather conditions during this survey were generally fair with clear skies and very calm winds. Temperatures ranged from 65°F during the day to 27°F at night, with fairly high humidity at all times. Dense fog and frost was present both mornings (clearing by about 7:00 a.m.). The same methods were used to collect data at locations G3, G4 and G5 on Tuesday, January 23, through Thursday, January 25, 2001.

8.5.3.2 Noise Survey Results

Table 8.5-6, summarizes the average nighttime L_{90} readings between 10 p.m. to 7 a.m. for each location.

The complete data set is included in Appendix 8.5A. Tables 8.5A-1 thorough 8.5A-5 and Figures 8.5A-1 through 8.5A-5 present the hourly values at G1 through G5. The 15-minute interval data is presented in Tables 8.5A-6 through 8.5A-10 and Figures 8.5A-6 through 8.5A-10.

TABLE 8.5-6
Summary of Average Nighttime L_{90} (dBA)

Location	10 p.m. to 7 a.m.	Average L_{90}
G1	Night #1	31
	Night #2	32
G2	Night #1	45
	Night #2	45
G3	Night #1	31
	Night #2	34
G4	Night #1	36
	Night #2	37
G5	Night #1	42
	Night #2	35

8.5.4 Environmental Consequences

The proposed power plant will produce noticeable noise but the noise levels will be in compliance with the City of San Joaquin Noise Ordinance. Noise will also be produced at the site during the construction phase of the project. Potential noise impacts from these activities are assessed in this section.

8.5.4.1 Significance Criteria

8.5.4.1.1 CEQA

The City of San Joaquin has established quantitative standards for determining appropriate noise levels for various land use types within the City. Consistent with Section 15064 of the CEQA Guidelines, the quantitative standards established by the City are used to determine the significance of noise impacts from the project. Therefore, noise impacts would be considered significant if project operation activities would conflict with the City of San Joaquin Noise Ordinance or the General Plan standards by exceeding 50 dBA at residential receptors.

A noise-level increase of more than 5 dBA above ambient noise levels at a noise-sensitive location would typically be considered a significant impact. However, a 5-dBA increase above ambient levels would not be considered significant if the City of San Joaquin Noise Ordinance and General Plan standards are met.

8.5.4.1.2 California Energy Commission

Although there are no regulatory limits set by the State of California or the City of San Joaquin regarding an allowable increase in noise above background caused by industrial projects, the California Energy Commission has historically considered a 5-dBA increase over the nighttime L_{90} at the nearest sensitive receptor as a standard over which additional noise analysis is required to determine whether a significant adverse impact occurs. An increase of more than 5 dBA over the nighttime L_{90} at the nearest sensitive receptor is generally presumed by the CEC to result in a significant impact.

The 5-dBA threshold of significance is especially relevant in cases where the noise environment is already impacted, and any incremental noise level increase may result in some adverse effect. In some such instances, the existing noise environment already exceeds the standards set by local LORS, so that a new project may not be able to comply with the local LORS; in these cases a 5-dBA sound level increase provides a guideline for acceptable impacts when local LORS are already exceeded. For project sites that are located away from population centers and major transportation corridors, a 5-dBA or higher sound level increase would likely occur over a large area given the existing quiet noise environment. However, an increase of more than 5-dBA in noise levels in a very quiet environment may not necessarily result in a significant adverse effect. This is because the overall background and project noise levels could still be low enough to not cause much annoyance. In such a case, the most restrictive absolute noise levels as established by the LORS would provide an appropriate means of determining any impact significance.

The San Joaquin City Council considered potential noise effects of industrial uses on the site when it first designated the project area as Industrial Reserve in the 1996 San Joaquin General Plan. Subsequent decisions to annex the site, amend its General Plan designation from Industrial Reserve to Industrial, and rezone the site also considered noise effects. Therefore, allowable noise levels for the project site have already been established by the City of San Joaquin, and constitute applicable LORS for the CVEC project.

8.5.4.2 Construction Impacts

This section addresses the various components of construction noise and vibration.

8.5.4.2.1 Worker Exposure to Noise

Worker exposure levels during construction of the CVEC will vary depending on the phase of the project and the proximity of the workers to the noise-generating activities. Hearing protection will be available for workers and visitors to use as needed throughout the duration of the construction period. A hearing protection plan, which complies with Cal-OSHA requirements, will be incorporated into the Health and Safety Plan.

8.5.4.2.2 Plant Construction Noise

Construction of the CVEC is expected to be typical of other power plants in terms of schedule, equipment used, and other types of activities. The noise level will vary during the construction period, depending upon the construction phase. Construction of power plants can generally be divided into five phases that use different types of construction equipment. The five phases are: 1) site preparation and excavation; 2) concrete pouring; 3) steel erection; 4) mechanical; and 5) clean-up (Miller et al., 1978). The typical high-pressure steam blow activity is generally assessed separately because of the high noise levels and potential for short-term significant noise impacts.

Both the USEPA Office of Noise Abatement and Control and the Empire State Electric Energy Research Company have extensively studied noise from individual pieces of construction equipment as well as from construction sites of power plants and other types of facilities (USEPA, 1971; Barnes et al., 1976). Since specific information on types, quantities, and operating schedules of construction equipment is not available at this point in project development, information from these documents for similarly sized industrial projects will be used. Use of this data, which is between 21 and 26 years old, is conservative since the evolution of construction equipment has been toward quieter designs to protect operators from exposure to high noise levels.

The loudest equipment types generally operating at a site during each phase of construction are presented in Table 8.5-7. The composite average or equivalent site noise level, representing noise from all equipment, is also presented in the table for each phase.

TABLE 8.5-7
Construction Equipment and Composite Site Noise Levels

Construction Phase	Loudest Construction Equipment	Equipment Noise Level (dBA) at 50 feet	Composite Site Noise Level (dBA) at 50 feet
Site Clearing and Excavation	Dump Truck Backhoe	91 85	89
Concrete Pouring	Truck Concrete Mixer	91 85	78
Steel Erection	Derrick Crane Jack Hammer	88 88	87
Mechanical	Derrick Crane Pneumatic Tools	88 86	87
Cleanup	Rock Drill Truck	98 91	89

Source: USEPA, 1971; Barnes et al., 1976.

Average or equivalent construction noise levels projected to the nearest residences from the site are presented in Table 8.5-8. These results are conservative since the only attenuating mechanism considered was divergence of the sound waves in open air. The construction noise may be audible at the nearest residences but will not exceed current exposure levels and the noisiest construction activities will be confined to the daytime hours when ambient noise is the loudest.

TABLE 8.5-8
Average Construction Noise Levels at the Closest Receptor

	Noise Level (dBA)	
Construction Phase	1,500 feet	3,000 feet
Site Clearing and Excavation	59	53
Concrete Pouring	48	42
Steel Erection	57	51
Mechanical	57	51
Clean-Up	59	53

Table 8.5-9 shows that unsilenced steam blows would exceed any reasonable impact criteria; consequently, a temporary blowout silencer, such as a Fluid Kinetics Model TBS 16-AC, or similar, will be used. Such a silencer has an overall noise reduction of 40 to 45 dBA and would reduce the estimated unsilenced level to 89 dBA (at 50 feet) putting it in the same category as heavy construction equipment. Since it is common practice to only carry out these blows during the day, silenced blows should produce no significant disturbance.

TABLE 8.5-9
Maximum Noise Levels from Common Construction Equipment and Closest Receptor Noise Level

Construction Equipment	Typical Sound Pressure Level at 50 feet (dBA)	Typical Sound Pressure Level at 1,500 feet (dBA)
Unsilenced Steam Blow (4- to 8-inch Line)	129	99
Silenced Steam Blow (4- to 8-inch Line)	89	59
Unsilenced Air Blow (4- to 8-inch Line)	125	95
Pile Drivers (20,000-32,000 ft-lbs./blow)	104	74
Dozer (250-700 hp)	88	58
Front End Loader (6-15 cu. yds.)	88	58
Trucks (200-400 hp)	86	56
Grader (13 to 16 ft. blade)	85	55
Shovels (2-5 cu. yds.)	84	54
Portable Generators (50-200 kW)	84	54
Derrick Crane (11-20 tons)	83	53
Mobile Crane (11-20 tons)	83	53
Concrete Pumps (30-150 cu. yds.)	81	51
Tractor (3/4 to 2 cu. yds.)	80	50
Unquieted Paving Breaker	80	50
Quieted Paving Breaker	73	43

Noise generated during the testing and commissioning phase of the project is not expected to be substantially different from that produced during normal full-load operation. Starts and abrupt stops are more frequent during this period, but on the whole they are usually short-lived. The steam releases associated with these starts and stops should not be problematic since they will be vented through permanent vent silencers.

8.5.4.2.3 Construction Vibration

Construction vibrations can be divided into three classes, based on the wave form and its source:

Wave form: Impact.	Example source: impact pile driver or blasting
Wave form: Steady state.	Example source: vibratory pile driver
Wave form: Pseudo steady state	Example source: double acting pile hammer

The pile driver, if required to be used for the project, would impart a relatively limited energy to the surrounding soil and this activity would occur at a significant distance from neighborhood structures and facilities. Therefore, it is not expected that there will be any significant vibration effect during construction of the proposed project.

8.5.4.3 Operational Impacts

This section describes the expected noise impacts from operation of the plant.

8.5.4.3.1 Worker Exposure to Operational Noise

Nearly all components will be specified not to exceed near-field maximum noise levels of 90 dBA at 3 feet (or 85 dBA at 3 feet where available as a vendor standard). Since there are no permanent or semi-permanent workstations located near any piece of noisy plant equipment, no worker's time-weighted average exposure to noise should approach the level allowable under OSHA guidelines. Nevertheless, signs requiring the use of hearing protection devices will be posted in all areas where noise levels commonly exceed 85 dBA, such as inside acoustical enclosures. Outdoor levels throughout the plant will typically range from 90 dBA near certain equipment to roughly 65 dBA in areas more distant from any major noise source.

8.5.4.3.2 Transmission Line and Switchyard Noise Levels

The electrical output of the plant will be connected to the existing 230-kV transmission line about 1,500 feet south of the site. The project will not require the construction of new transmission line near residential properties. Consequently, no impact is expected from either the construction or the operation of the electrical transmission line. Also, the low-frequency hum emitted by the switchyard will be inaudible at all of the receptors because of the relatively large intervening distances.

8.5.4.3.3 Plant Operation Noise Levels

The principal method for predicting sound levels is based on three basic parts, the power of the sound source (L_w), the geometry over which the sound is propagated, absorbed, and scattered (A), and the resulting sound pressure level (L_p), which is heard and measured by a sound level meter. Basically, this is described by:

$$L_p = L_w - A, \text{ dB}$$

As an analogy, think of a light bulb, which has a power level of watts (L_w) but the brightness of the light (L_p) is determined by how close or how far away you are and if it is blocked or absorbed (A) by an object. Sound behaves in a similar fashion.

The site was computer modeled using the methodology of recognized international and national standards including power plant acoustical design and methodology as promulgated by the U.S. power industry. Over 120 significant sources of sound were modeled on a master coordinate grid and geometrically defined as to their shape and sound power level (similar to a finite element model) and the results either graphically illustrated or tabulated. Accuracy is largely controlled by the variability of the equipment's sound level; thus, modeling is as accurate as reasonably possible while still providing a modest level of conservatism to account for unexpected changes to the site and equipment.

Figure 8.5-2 shows the noise contours of the expected sound levels in the immediate vicinity of the project. Table 8.5-10 summarizes the results at the first ring of receptors around the project. The analysis shows that the sound levels at the closest residential areas are all below the City of San Joaquin's Noise Ordinance requirement of 50 dBA. In addition, the project noise levels comply with the USEPA guideline of 49 dBA designed to protect against activity interference and annoyance at rural residences.

TABLE 8.5-10
Predicted Noise Levels at the Closest Sensitive Receptors

Map Identifier	Predicted Sound Pressure Level (dBA)
R1 (G1)	45.0
R3	43.9
R5	48.3
R9 (G4)	48.1
R10 (G5)	45.5
G2	48.7

Refer to Figure 8.5-2 for locations.

8.5.4.3.4 Tonal Noise

Combined cycle plants have several components that can produce tones. These include the cooling tower circulating water pumps, boiler feed pumps, condensate pumps and gas metering station. At the nearest receptor, these tones may be heard at night when the natural environment becomes quieter.

Field measurements of comparable major equipment are given in Table 8.5-11. These levels were recorded near standard equipment without any unusual noise control measures applied. The actual values for the equipment within the CVEC facility will in many cases be lower after necessary noise controls or enclosures are added.

TABLE 8.5-11
Typical Far Field Sound Pressure Levels at 400 feet from Standard Unattenuated Equipment

	Octave Band Center Frequency, Hz									
Plant Component	31.5	63	125	250	500	1k	2k	4k	8k	dBA
Combustion Turbine Encl.	50	53	50	46	44	42	52	52	34	57
CTG Inlet Duct	64	63	52	58	51	48	39	34	27	54
HRSG Inlet Duct	69	69	63	56	54	53	49	55	43	60
Boiler Feed Pump	61	54	55	55	55	58	55	51	45	61
Steam Turbine and STG Condenser	59	62	62	59	56	55	57	54	47	62
Main CTG/STG Transformers	49	55	57	52	52	46	41	36	29	52
Circulating Water Pump	39	36	37	33	34	37	37	30	21	42
Condensate Pump	---	48	47	45	46	43	43	44	45	51
Cooling Tower Air Inlet	74	74	67	60	56	55	56	52	42	62

8.5.4.3.5 Ground and Airborne Vibration

Ground and airborne induced vibration from operation of the proposed project will not affect the local area. The proposed project is primarily driven by gas turbines exhausting into a heat recovery steam generator (HRSG), which is contiguous with a selective catalytic reduction (SCR) duct. These very large ducts greatly reduce low frequency noise, which is mainly the source of airborne induced vibration of structures.

The equipment that would be used in the proposed project is well balanced and is designed to produce very low vibration levels throughout the life of the proposed project. An imbalance could contribute to ground vibration levels in the vicinity of the equipment. However, vibration-monitoring systems installed in the equipment are designed to ensure that the equipment remains balanced. Should an imbalance occur, the event would be detected and the machines would automatically shut down.

8.5.4.3.6 Structural Vibration Induced by Airborne Noise Emissions

Gas turbines in simple cycle operation commonly produce airborne low frequency noise emissions that are capable of inducing perceptible vibration in nearby structures with lightweight frame construction. Gas turbines that exhaust into HRSGs, on the other hand, rarely, if ever, cause this type of problem. The expansion of the combustion turbine exhaust gases inside the relatively large cavity of the HRSG and the subsequent contraction in the exhaust stack act to dissipate acoustic energy. The ability of HRSGs to attenuate turbine exhaust noise, even when no specific silencing measures are incorporated into the design, is well-established. The HRSG ducting and SCR unit are anticipated to eliminate any structural vibration induced by airborne noise in a similar manner.

8.5.5 Mitigation Measures

The following design measures were included in the project design to minimize the potential noise impacts from the project.

- Combustion turbines enclosed in an acoustical enclosure designed to limit near field noise levels to 85 dBA at 3 feet
- Noise enclosure on steam turbine generator
- Silencers on relief valve stacks
- Design of major components to limit near field maximum noise levels to less than 90 dBA at 3 feet (or 85 dBA at 3 feet where available as a vendor standard)
- Location of power block on the project site to maximize distance to nearest residential areas
- Temporary silencers will be used during steam blow operation to quiet the steam blow noise to no greater than 100 dBA measured at a distance of 100 feet

8.5.6 Involved Agencies and Agency Contacts

Agency contacts relative to noise issues are presented in Table 8.5-12.

TABLE 8.5-12
Agency Contacts

Agency	Contact	Issue	Telephone
City of San Joaquin	Lupe Estrada Assistant to City Manager	Noise Ordinance	559-693-4311

8.5.7 Permits Required and Permit Schedule

No permits are required; therefore, there is no permit schedule.

8.5.8 References

Barnes, J.D., L.N. Miller, and E.W. Wood. 1976. Prediction of Noise from Power Plant Construction. Bolt Beranek and Newman, Inc., Cambridge, Massachusetts. Prepared for Empire State Electric Energy Research Corporation, Schenectady, New York.

Beranek, L.L. 1998. Noise and Vibration Control. Institute of Noise Control Engineering. McGraw Hill.

City of San Joaquin, 1996. Comprehensive General Plan and EIR.

City of San Joaquin. 2001. San Joaquin Municipal Code.

Hessler Associates. 2001. Personal communication between Elden Ray and CH2M HILL. (Multiple reports and emails).

International Organization for Standardization. 1996. Acoustics—Attenuation of sound during propagation outdoors, Part 2: General method of calculation ISO 9613-2, Geneva.

Miller, Laymon N., et al., *Electric Power Plant Environmental Noise Guide*, 2nd Edition, Edison Electric Institute, New York, 1984.

Miller, L.N., E.W. Wood, R.M. Hoover, A.R. Thompson, and S.L. Thompson, and S.L. Paterson. 1978. *Electric Power Plant Environmental Noise Guide*, Vol. 1. Bolt Beranek & Newman, Inc. Cambridge, MA. Prepared for the Edison Electric Institute, New York, NY.

Outdoor Sound Propagation, VDI 2714, VDI (Verein Deutscher Ingenieure)—Verlag GmbH, Dussledorf, 1988

Peterson, Arnold P.G. and Ervin E. Gross, Jr. 1974. Handbook of Noise Measurement, 7th Ed. GeuRad. Concord, Massachusetts.

USEPA (U.S. Environmental Protection Agency). 1971. Noise from Construction Equipment and Operations, US Building Equipment, and Home Appliances. Prepared by Bolt Beranek and Newman for USEPA Office of Noise Abatement and Control, Washington, D.C.

USEPA. 1974. Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety. 550/9-74-004, Office of Noise Abatement and Control, Washington, D.C.

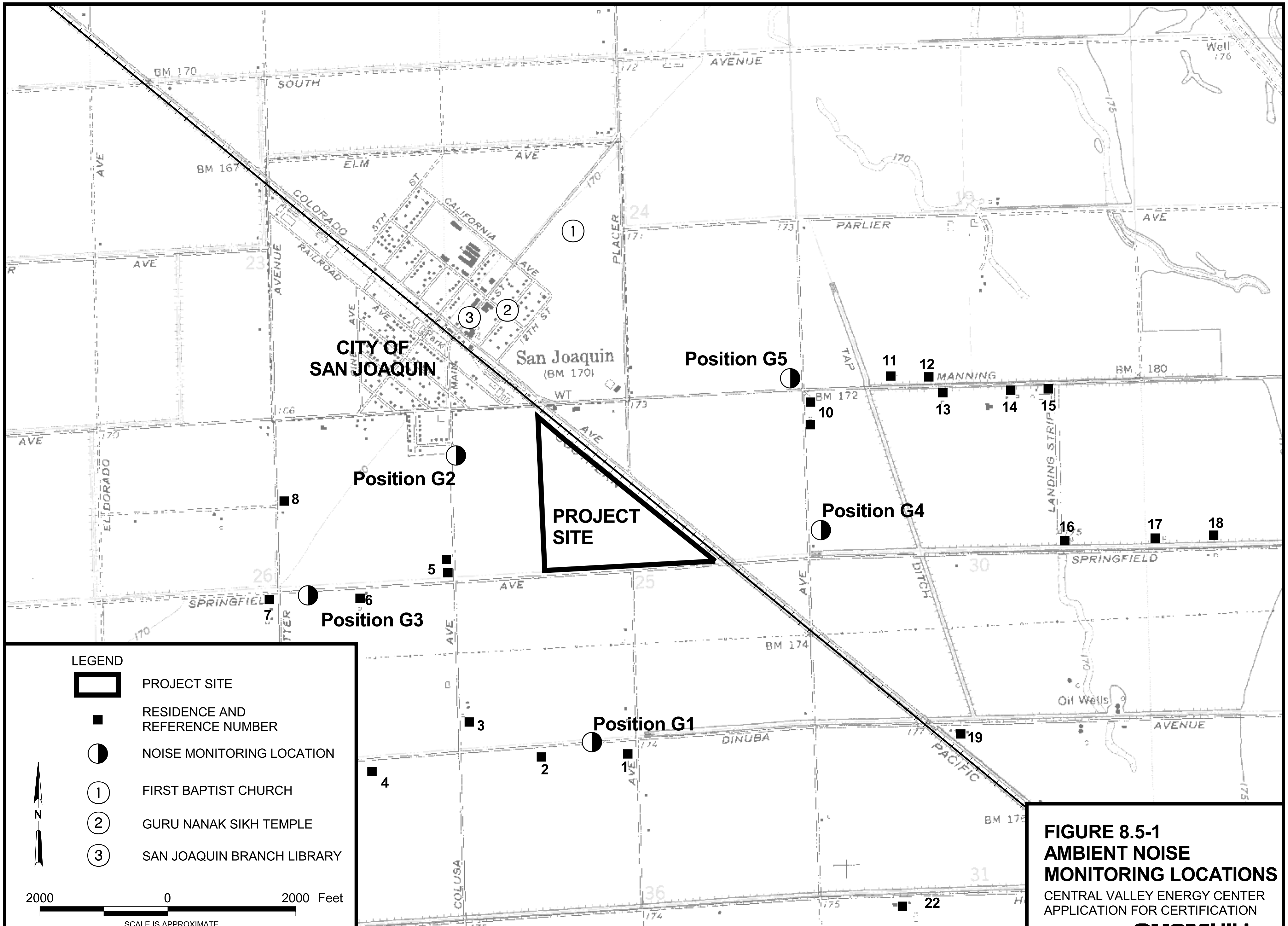

FIGURE 8.5-1
AMBIENT NOISE MONITORING LOCATIONS

CENTRAL VALLEY ENERGY CENTER
APPLICATION FOR CERTIFICATION

CH2MHILL

CH2M Hill RDD ArcView Project File \\Thor\Cart1\rddgis\cvec\cvec_gas_water_species.apr 10:07 a.m. 10-4-2001

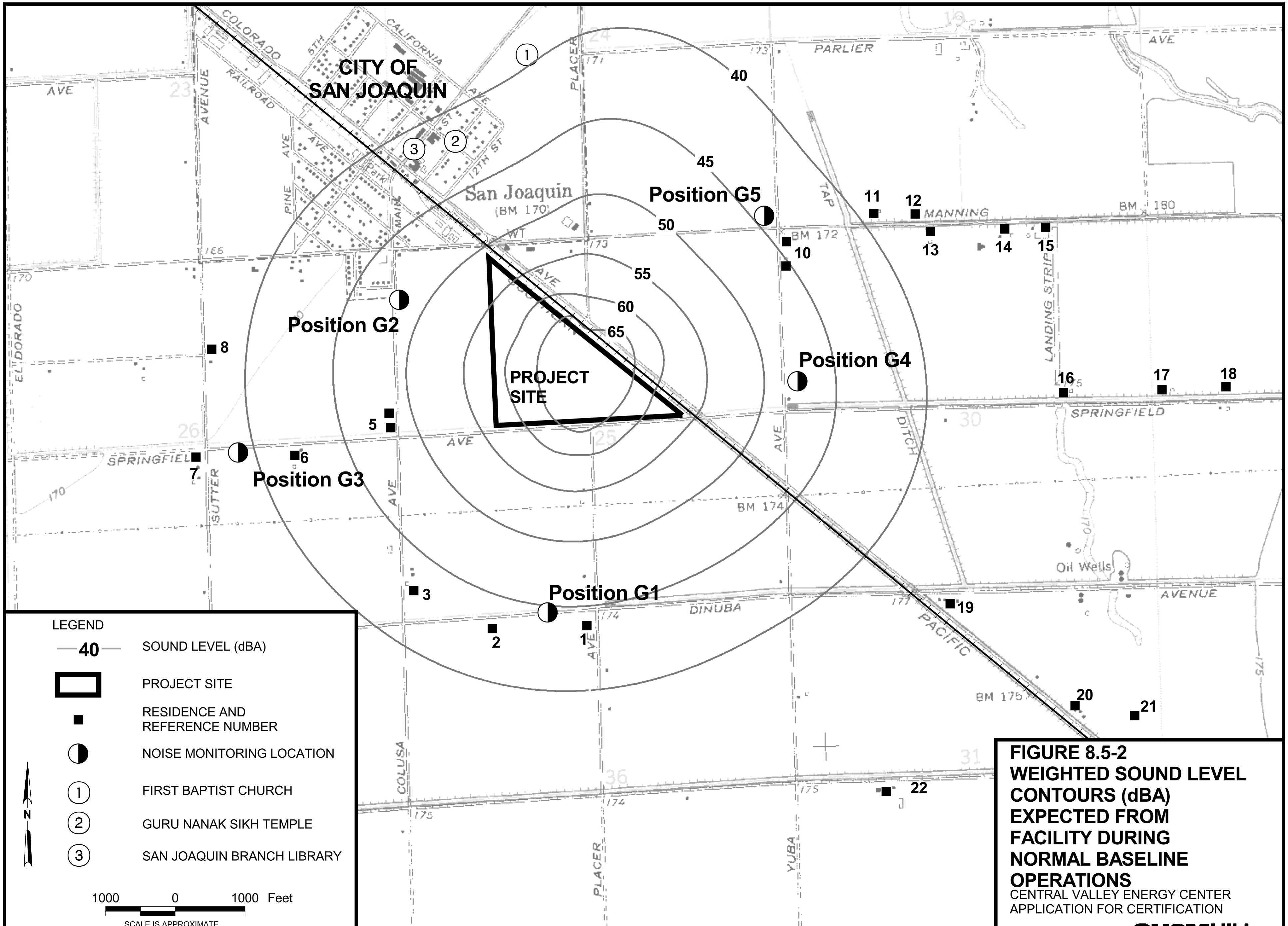

FIGURE 8.5-2
WEIGHTED SOUND LEVEL CONTOURS (dBA) EXPECTED FROM FACILITY DURING NORMAL BASELINE OPERATIONS
CENTRAL VALLEY ENERGY CENTER
APPLICATION FOR CERTIFICATION

CH2MHILL

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